Evaluation of early growth performance of backcross progenies from crossbred gilts mated with their native parents

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Abstract

The pre weaning growth performance of piglets from four different cross bred dams mated back to their native parent was studied in the Breeding and Research Farm of Ebonyi State University, Abakaliki. Parameters like body weight, weight gain, feed intake and feed efficiency as well as linear body measurements of body length, heart girth and height at withers were taken and observed for growth between birth and weaning age of eight weeks. Results indicated significant differences ($P < 0.05$) between the main backcross $N \times (N \times LR)$ and the three other genotypes of $N \times (N \times LW)$, $N \times (LR \times N)$ and $N \times (LW \times N)$ in all parameters. The mean birth weight of the progenies ranged from 1.00 ± 0.60 to 1.60 ± 0.5 kg while the weaning weights were 10.5 ± 0.4 to 16.0 ± 1.0 kg respectively. Results further revealed that body weight at weaning correlated positively with all parameters and these include body length ($r = 0.858$), heart girth ($r = 0.446$) and height at the withers ($r = 0.946$). Similarly, body length has a positive correlation with heart girth ($r = 0.477$) and height at the withers ($r = 0.827$) whereas heart girth correlated positively with height at the withers ($r = 0.494$). Similar trend were obtained in the regression of each of the body measurements on the other in which bodyweight changes depended more on that of body length (0.86) than on heart girth (0.45). Judging from the observed variations existing among the piglets resulting from different crossbred dams in their pre-weaning growth performance, maternal rather than paternal influences appeared to be more important in the traits studied.

Keywords: Early growth, backcross, Progenies, native parents, genotypes, performance and body measurements.

Introduction

Pig production has been increasing in importance in both developing and developed countries. Pig number rank second only to poultry in terms of rate of increase from 1960 to 1990, stocks increased by 45% and 201% in developed and developing countries, respectively (FAO, 1992). The increase is largely attributed to proliferation of a few breeds of pigs, and the erosion of important genetic diversity in several indigenous breeds of pigs. Over 20% of some known breeds of pigs are at high risk of extinction.

Animal genetic diversity allows farmers to select stocks or develop new breeds in response to changes in the environment, threats of disease, new knowledge of human nutrition requirement, changing market conditions and societal needs, all of which are largely unpredictable. Animal genetic diversity is critical for achieving food security for the rapidly growing population, not only with respect to the local or national situation, but also because countries are becoming increasingly interdependent for access to unique animal genetic resources.

In addition, in developed countries, consumer emphasis on product quality is increasing, markets are becoming more segmented and efficiency of input resource use is being increasingly emphasized. These needs will intensify and broaden efforts in the genetic development of animals for production, productivity, product quality and to help sustain primary, national and regional agro ecosystems.

In Nigeria, commercial pig production has been maintained mainly through the use of imported exotic breeds and their cross (Adebambo, 1986., Ikeobi and Ngere, 1994). Consequently, the availability of breeds differing in their reproductive characteristics is an important source of flexibility that can allow more rapid adjustments to changing economic conditions in the country. However, a sound knowledge of this important aspect of animal production and its interreaction with the environment is essential for a maximum and rational utilization of the breeding stock.

The degree of maturity of a trait which is measured as the value of the trait at an immature age as a percentage of that trait at maturity is also of considerable practical interest in connection with the time scale of growth. The inclusion of our native pig in existing pig farms will help to understand more the growth, production and adaptive capability of the native stock when crossed with the exotic breeds and their crosses. It therefore becomes necessary to weigh measure and obtain baseline data on the growth performances of backcross progenies generated from first generation crossbred gilts when crossed with their native parent. This will help us to assess the breeding value of the backcross gilts in the long run, evaluate the intra-sire growth performance of the piglets from the main and reciprocal crossbred gilts as well as estimate the intra-sire relationship between the growth parameters from birth to weaning.

Materials and Methods

Animals

The experiment was conducted at the piggery breeding unit of the Department of Animal Science, Ebonyi State University, Abakaliki. A total of twenty crossbred gilts and five native boars (at a ratio of four crossbred gilts to one inbred native boar) to represent one breeding group. The crossbred gilts are main crossbreds of native X landrace (N x LR) native X large white (N x LW) and their reciprocal crossbred gilts of landrace X native (LR x N) and large white X native (LW x N) respectively.

Experimental Site:

This is a standard block with open sides covered with net, concrete floor and roofed with asbestos roofing sheets, each pen measuring 4m x 7.5m long, with feeding, drinking and wallowing troughs. Four crossbred gilts were housed in one pen in a fly proof open ventilated houses and maintained on compounded concentrate, at the rate of 1.5 to 2.5kg/pig/day; depending on their age and physiological status. Experimental animals were occasionally dewormed with levaject injectable and dry sulphur mixed with condemned engine oil for ectoparasites like sarcoptic mange.

Experimental procedure:

The experimental gilts were closely observed for cyclic oestrus on observation of third pubertal oestrus at 8½ months old; a gilt/sow was mated on two consecutive times with an inbred native boar. A dam that returned on heat was remated.

Measurement of the animals:

The piglets were nursed according to their litter mates and data on body weight, weight gain, feed intake and feed efficiency were calculated. Linear body measurements, such as; body length, heart girth, and height at the withers were taken from birth to weaning.

Statistical Analysis:

All data collected on body weight, weight gain, feed intake and feed efficiency of the piglets were subjected to Analysis of variance using least

square means and Duncan's multiple range test, Duncan (1955) was employed to separate significant means. Also, piglets were measured for body length, heart girth and height at withers and data processed to obtain growth rates from birth to weaning. Again, coefficients of correlation and regression were obtained to ascertain relationship and the degree of influence which body weight and other body parameters between birth to weaning had with each other among the piglets from the main and reciprocal sows backcrossed to their native parent. Significance of within sire differences were detected by means of a one-tail t-test as adopted by Omeje, (1985)

Results

Table I shows that, there was significant ($P < 0.05$) differences in the body weight of the main backcross of $N \times (N \times LR)$ and $N \times (N \times LW)$ and their reciprocals $N \times (LR \times N)$ and $N \times (LW \times N)$ in the first week of birth. But, no significant ($P > 0.05$) differences existed in their weight gain, feed intake and feed efficiency. However, week two recorded significant differences ($P < 0.05$) in body weight and weight gain between the main and reciprocal backcrosses, while feed intake and feed efficiency were not different among the genotypes.

Significant differences ($P < 0.05$) in body weight and weight gain while lack of significant ($P > 0.05$) differences in feed intake and feed efficiency among the genotypes were recorded during weeks three, four and five of age. This trend continued as from weeks six to eight during which, significant ($P < 0.06$) difference manifested between the main backcross of $N \times (N \times LR)$ and the rest of other three genotypes. These three genotypes were not significantly ($P > 0.05$) different in their body weight, weight gain, intake and feed efficiency performances.

Table 2 shows superiority ($P < 0.05$) of the three genotypes of $N \times (N \times LW)$, $N \times (LR \times N)$ and $N \times (LW \times N)$ over and above the main backcross

of $N \times (N \times LR)$ from birth to weaning age of eight weeks in their body length height at withers and heart girth performance of the piglets.

Table 3 shows that body weight correlated positively with all other parameters and these include body length ($r = 0.858$), heart girth ($r = 0.446$), height at the withers ($r = 0.946$). The same table also shows positive correlation between body length and heart girth ($r = 0.477$) and height at the withers ($r = 0.827$) respectively. Heart girth also correlated positively with height at the withers ($r = 0.494$). The regression coefficients of linear body measurements are presented in table 3.

Table 3 also shows that body weight regressed positively on body length (0.86); heart girth (0.45) and height at the withers (0.92). The regression coefficient for body length on heart girth (0.47) and height at the withers (0.83) were also positive. Similarly, the regression of height at the withers on heart girth was positive and moderate (0.49).

Discussion

There were significant differences ($P < 0.05$) in the body weight of the backcross progenies. However, main backcross $N \times (N \times LR)$ which had the least body weight at the first week of birth maintained that position up to weaning. The other three genotypes of $N \times (N \times LW)$, $N \times (LR \times N)$ and $N \times (LW \times N)$, reflected similar body weight, gain in weight and feed efficiency in the first week of birth. The similarity in body weight and other body parameters like weight gain, and anthropometric parameters in some age periods of the backcross progenies, shows that the heterosis earlier enjoyed at the (F_1) had started dispersing at the backcross level.

Growth rate generally according to Brody (1945) is slow at the beginning but rises quite rapidly slowing again at maturity. However, this depends upon the existing body weight of the individual

Table 1: Means $\pm$ S.E. and C.V. of body weight, weight gain, feed intake and feed efficiency as affected by genotypes.

Age (Weeks)	Parameter	Genotypes			
		N x (N x LR)	N x (N x LW)	N x (LR x N)	N x (LW x N)
1	Bodyweight (c.v)	1.0 $\pm$ 0.60 ^a (0.5)	1.5 $\pm$ 0.2 ^b (0.6)	1.43 $\pm$ 0.3 ^b (0.6)	1.6 $\pm$ 0.5 ^b (0.4)
	weight gain (c.v)	0.8 $\pm$ 0.2 (0.1)	1.0 $\pm$ 0.1 (0.0)	0.9 $\pm$ 0.3 (0.0)	1.0 $\pm$ 0.4 (0.0)
	feed efficiency (c.v.)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
	feed efficiency (c.v.)	0.8 $\pm$ 0.2 (0.2)	1.0 $\pm$ 0.1 (0.1)	0.9 $\pm$ 0.3 (0.00)	1.0 $\pm$ 0.4 (0.0)
2	Bodyweight (c.v)	3.0 $\pm$ 0.4 ^a (0.8)	4.5 $\pm$ 0.5 ^b (0.9)	3.9 $\pm$ 0.6 ^b (1.0)	4.6 $\pm$ 0.1 ^b (1.2)
	Weight gain (c.v.)	1.2 $\pm$ 0.3 ^a (1.1)	1.8 $\pm$ 0.2 ^b (1.5)	1.6 $\pm$ 0.4 ^b (1.0)	2.0 $\pm$ 0.1 ^b (1.2)
	Feed intake (c.v.)	0.4 $\pm$ 0.0 (1.1)	0.8 $\pm$ 0.1 (0.3)	0.65 $\pm$ 0.1 (1.4)	0.6 $\pm$ 0.1 (0.1)
	feed efficiency (c.v)	0.8 $\pm$ 0.3 (0.6)	0.8 $\pm$ 0.2 (0.11)	0.6 $\pm$ 0.4 (0.4)	0.9 $\pm$ 0.1 (0.3)
3	Bodyweight (c.v.)	4.0 $\pm$ 1.0 ^a (1.2)	6.0 $\pm$ 0.1 ^b (1.4)	4.5 $\pm$ 0.1 ^a (1.6)	5.6 $\pm$ 0.3 ^b (1.7)
	weight gain (C.v.)	1.1 $\pm$ 0.3 ^a (0.7)	1.6 $\pm$ 0.4 ^b (0.9)	1.3 $\pm$ 0.2 ^a (0.8)	1.01 $\pm$ 0.67 ^a (0.7)
	feed intake (c.v)	0.86 $\pm$ 0.1 (0.3)	0.9 $\pm$ 0.1 (0.2)	0.95 $\pm$ 0.2 (0.4)	0.96 $\pm$ 0.2 (0.2)
	feed efficiency (c.v)	1.6 $\pm$ 0.2 (0.41)	1.4 $\pm$ 0.1 (0.36)	1.5 $\pm$ 0.1 (0.49)	1.8 $\pm$ 0.11 (0.5)
4	Body weight (c.v.)	5.1 $\pm$ 0.3 ^a (1.2)	7.0 $\pm$ 0.1 ^b (1.4)	6.0 $\pm$ 0.5 ^b (1.5)	6.8 $\pm$ 0.3 ^b (1.3)
	weight gain (c.v.)	1.2 $\pm$ 0.1 ^a (0.7)	1.8 $\pm$ 0.3 ^b (0.9)	1.6 $\pm$ 0.4 ^b (0.8)	1.7 $\pm$ 0.3 ^b (0.67)
	feed intake (c.v.)	0.9 $\pm$ 0.2 (1.3)	1.0 $\pm$ 0.2 (1.4)	1.05 $\pm$ 0.4 (1.4)	1.06 $\pm$ 0.03 (1.3)
	Feed efficient (c.v.)	1.56 $\pm$ 0.2 (1.2)	1.7 $\pm$ 0.5 (1.3)	1.5 $\pm$ 0.4 (1.5)	1.7 $\pm$ 0.6 (1.8)
5	Body weight (c.v.)	6.5 $\pm$ 0.5 ^a (2.04)	8.5 $\pm$ 0.7 ^b (3.5)	7.6 $\pm$ 0.5 ^b (2.7)	8.4 $\pm$ 0.6 ^b (2.8)
	weight gain (c.v.)	1.6 $\pm$ 0.4 (0.3)	1.6 $\pm$ 0.3 (0.8)	1.65 $\pm$ 0.3 (0.2)	1.7 $\pm$ 0.5 (0.4)
	feed intake (c.v.)	1.0 $\pm$ 0.1 (0.3)	1.2 $\pm$ 0.5 (0.5)	1.1 $\pm$ 0.3 (0.2)	1.3 $\pm$ 0.6 (0.4)
	Feed efficient (c.v.)	1.7 $\pm$ 0.1 (0.1)	1.53 $\pm$ 0.3 (0.4)	1.5 $\pm$ 0.3 (0.8)	1.35 $\pm$ 0.6 (0.5)
6	Body weight (c.v.)	8.0 $\pm$ 0.10 ^a (4.5)	9.0 $\pm$ 1.2 ^b (3.2)	8.5 $\pm$ 1.0 ^b (4.2)	9.2 $\pm$ 1.0 ^b (5.2)
	weight gain (c.v.)	1.5 $\pm$ 0.10 ^b (2.2)	0.9 $\pm$ 1.0 ^a (2.5)	0.9 $\pm$ 0.1 ^a (2.1)	0.8 $\pm$ 0.8 ^a (2.0)
	feed intake (c.v.)	1.0 $\pm$ 1.2 (1.4)	1.2 $\pm$ 0.5 (1.2)	1.1 $\pm$ 0.4 (1.2)	1.3 $\pm$ 0.8 (1.1)
	Feed efficient (c.v.)	1.55 $\pm$ 0.1 ^b (1.8)	0.86 $\pm$ 1.2 ^a (4.8)	0.86 $\pm$ 0.1 ^a (4.9)	0.75 $\pm$ 0.1 ^a (3.2)
7	Body weight (c.v.)	9.0 $\pm$ 0.5 ^a (3.2)	12.0 $\pm$ 1.0 ^b (4.8)	11.5 $\pm$ 0.5 ^b (3.1)	13.0 $\pm$ 0.6 ^b (3.5)
	weight gain (c.v.)	1.5 $\pm$ 0.5 ^b (2.10)	1.0 $\pm$ 0.1 ^a (2.40)	1.0 $\pm$ 0.8 ^a (2.2)	0.9 $\pm$ 0.8 ^a (2.0)
	feed intake (c.v.)	1.0 $\pm$ 0.10 (0.8)	1.2 $\pm$ 0.5 (0.9)	1.2 $\pm$ 0.5 (1.10)	1.3 $\pm$ 0.8 (1.0)
	Feed efficient (c.v.)	1.10 $\pm$ 0.2 ^a (5.8)	2.0 $\pm$ 0.33 ^b (4.3)	2.0 $\pm$ 0.43 ^b (2.8)	2.38 $\pm$ 0.46 ^b (4.01)
8	Body weight (c.v.)	10.5 $\pm$ 0.4 ^a (2.5)	15 $\pm$ 1.0 ^b (4.6)	14.2 $\pm$ 1.0 ^b (2.8)	16.0 $\pm$ 1.0 ^b (4.16)
	weight gain (c.v.)	1.05 $\pm$ 0.5 ^a (1.05)	3.0 $\pm$ 1.0 ^b (2.4)	2.18 $\pm$ 1.0 ^b (1.86)	2.9 $\pm$ 1.05 ^{bl} (1.9)
	feed intake (c.v.)	1.20 $\pm$ 0.1 (1.46)	1.4 $\pm$ 0.3 (1.36)	1.4 $\pm$ 0.3 (1.82)	1.5 $\pm$ 0.4 (2.01)
	Feed efficient (c.v.)	0.89 $\pm$ 0.1 (0.36)	2.15 $\pm$ 0.1 (1.10)	2.0 $\pm$ 0.1 (1.30)	1.93 $\pm$ 0.33 (1.44)

^{a,b} - Means bearing different superscripts are statistically different (P<0.05)

C.V:- Coefficient of Variation.

S.E:- Standard error of means in parenthesis

animal. This have been corroborated by Nwosu and Omeje (1984). Most farm animals including the chicken have their body weight doubled within 2-4 weeks depending on the species, breed and type of animal.

Early growth period (pre-weaning) is the period of maximum velocity of growth at which gains are most rapid and perhaps most economical. However, in the backcross, the F₁ crossbred dams were back mated to one group of the male parents

(native) used in the first cross. The smaller body size of the native boar constrained the F₁ crossbred gilts and therefore leveled up the body weight of the backcross genotypes.

This shows that, at F₂/backcross generations, the individual will loose approximately half of the heterosis observed in the F₁, but the maternal component will show their full effects. With about seventy five percent of the native genome in the backcross genotypes, the recessive growth

Backcross progenies from crossbred gilts mated with their native parents

Table 2: Means $\pm$ S.E. and C.V. of Body length, Height at withers and heartgirth of the backcross genotypes.

Age (Weeks)	Parameter	Genotypes			
		N X (N X LR)	N X (N X LW)	N X (LR X N)	N X (LW X N)
1	Body length (c.v)	12.7 $\pm$ 0.31 ^a (4.2)	17.4 $\pm$ 1.3 ^b (2.09)	16.70 $\pm$ 6.5 ^b (3.10)	18 $\pm$ 0.1 ^b (4.2)
	Height at withers (C.V)	7.8 $\pm$ 0.1 ^a (4.10)	10.5 $\pm$ 0.5 ^b (5.10)	11.05 $\pm$ 0.1 ^b (3.1)	12.50 $\pm$ 0.9 ^b (4.3)
	Heart girth (c.v)	9.3 $\pm$ 0.1 ^a (3.1)	12.1 $\pm$ 1.1 ^b (2.8)	14.1 $\pm$ 0.1 ^b (3.1)	13.1 $\pm$ 1.1 ^b (4.2)
2	Body length (c.v)	14.5 $\pm$ 0.5 ^a (3.2)	19.6 $\pm$ 2.3 ^b (4.0)	18.5 $\pm$ 0.5 ^b (3.5)	20.0 $\pm$ 1.0 ^b (3.6)
	Height at withers (C.V)	9.9 $\pm$ 0.3 ^a (3.6)	12.5 $\pm$ 0.4 ^b (3.4)	13.0 $\pm$ 1.0 ^b (3.2)	15.1 $\pm$ 0.8 ^b (4.2)
	Heart girth (c.v)	10 $\pm$ 0.3 ^a (3.2)	14.1 $\pm$ 1.0 ^b (2.9)	15.20 $\pm$ 0.1 ^b (3.7)	15.1 $\pm$ 2.0 ^b (3.8)
3	Body length (c.v)	16.0 $\pm$ 0.5 ^a (3.5)	23.0 $\pm$ 1.5 ^b (2.0)	21.5 $\pm$ 0.1 ^b (3.8)	24.10 $\pm$ 1.0 ^b (3.7)
	Height at withers (C.V)	11.5 $\pm$ 0.4 ^a (2.1)	15.1 $\pm$ 0.3 ^b (3.8)	16.1 $\pm$ 2.0 ^b (4.20)	18.1 $\pm$ 1.0 ^b (4.3)
	Heart girth (c.v)	21.3 $\pm$ 0.5 ^a (2.1)	16.2 $\pm$ 1.0 ^b (3.0)	17.1 $\pm$ 1.0 ^b (4.2)	17.4 $\pm$ 2.0 ^b (4.1)
4	Body length (c.v)	18.0 $\pm$ 1.0 ^a (3.2)	24.0 $\pm$ 1.6 ^b (4.0)	23.1 $\pm$ 1.0 ^b (3.5)	25.0 $\pm$ 2.0 ^b (3.9)
	Height at withers (C.V)	13.0 $\pm$ 1.4 ^a (1.4)	16.03 $\pm$ 1.0 ^b (3.8)	17.0 $\pm$ 2.0 ^b (4.1)	19.0 $\pm$ 2.0 ^b (4.8)
	Heart girth (c.v)	14.0 $\pm$ 1.0 ^a (1.0)	18.1 $\pm$ 2.0 ^b (3.1)	18.1 $\pm$ 1.0 ^b (3.5)	18.5 $\pm$ 0.2 ^b (3.1)
5	Body length (c.v)	20 $\pm$ 2.0 ^a (3.5)	26.5 $\pm$ 1.0 ^b (4.2)	26.1 $\pm$ 1.0 ^b (3.8)	27.1 $\pm$ 2.0 ^b (4.2)
	Height at withers (C.V)	15 $\pm$ 1.5 ^a (1.4)	18.5 $\pm$ 1.4 ^b (3.9)	19 $\pm$ 1.0 ^b (4.5)	20.0 $\pm$ 1.0 ^b (4.3)
	Heart girth (c.v)	16.5 $\pm$ 2.0 ^a (4.2)	20.1 $\pm$ 1.0 ^b (3.3)	20.5 $\pm$ 1.0 ^b (3.6)	21.0 $\pm$ 2.0 ^b (4.9)
6	Body length (c.v)	22.10 $\pm$ 1.0 ^a (4.5)	27.8 $\pm$ 2.0 ^b (3.3)	28 $\pm$ 2.0 ^b (4.3)	29.9 $\pm$ 0.5 ^b (4.6)
	Height at withers (C.V)	16.1 $\pm$ 1.0 ^a (2.1)	19.5 $\pm$ 1.0 ^b (3.7)	21 $\pm$ 1.0 ^b (4.8)	22.1 $\pm$ 1.0 ^b (4.2)
	Heart girth (c.v)	18.1 $\pm$ 1.0 ^a (3.4)	22.1 $\pm$ 2.0 ^b (4.2)	23.1 $\pm$ 2.0 ^b (4.3)	23.4 $\pm$ 1.0 ^b (4.1)
7	Body length (c.v)	25.0 $\pm$ 2.0 ^a (1.6)	29.0 $\pm$ 2.0 ^b (3.5)	30.5 $\pm$ 2.0 ^b (5.3)	32.1 $\pm$ 0.5 ^b (4.8)
	Height at withers (C.V)	18.0 $\pm$ 1.0 ^a (4.1)	20 $\pm$ 2.0 ^b (3.9)	23.1 $\pm$ 0.2 ^b (4.9)	23.0 $\pm$ 2.0 ^b (4.3)
	Heart girth (c.v)	20 $\pm$ 2.0 (3.2)	24.1 $\pm$ 2.0 ^b (4.3)	25 $\pm$ 2.0 ^b (4.8)	26.0 $\pm$ 2.0 ^b (4.3)
8	Body length (c.v)	30.5 $\pm$ 3.5 ^a (5.0)	33.6 $\pm$ 2.0 ^b (4.6)	35.6 $\pm$ 4.0 ^b (6.4)	38.5 $\pm$ 4.0 ^b (5.8)
	Height at withers (C.V)	22.5 $\pm$ 2.0 ^a (2.3)	25.5 $\pm$ 2.0 ^b (4.8)	26.5 $\pm$ 2.0 ^b (3.1)	26.0 $\pm$ 2.0 ^b (4.8)
	Heart girth (c.v)	24 $\pm$ 2.0 ^a (4.0)	28 $\pm$ 2.0 ^b (4.5)	29 $\pm$ 1.0 ^b (4.6)	30.0 $\pm$ 1.5 ^b (6.5)

^{a, b} Means bearing same superscript are statistically ($P>0.05$) Similar.

C.V: Coefficient of variation

S.E: Standard error of means in parenthesis

genes will force even the exotic component impact to decline, thereby leveling up the performance of the backcross genotypes. Johnson (1981) in his summary of a large group of crossbreeding experiments involving swine had observed that heterosis for body weight was largely accounted for by intra-allelic dominance from the buffering effect of maternal influence at the first eight weeks of life. This situation was corroborated by Fairfull and Gavora (1993) for body weight in the chicken.

The results of this experiment indicate that the sire component of the variance is larger than the dam component which indicates sex linkage attributable to the male parent, but will not necessarily mean that maternal effect are absent.

It implies then, that if present, maternal effects are smaller than those due to sex lineage. Thus in this work, it is most probable that for body linear measurements, maternal effects may be important but not as sex linkage effects. Fayeye and Ayorinde (2000) had stated that, apart from heterosis, reciprocal differences or deviations between the crosses of two parent strains or breeds in which their role as male or female parents are reversed, represent another possible channel for economic exploitation of interbreed differences. In poultry for instance, reciprocal effect has been demonstrated to be of equal importance as heterosis for traits like sexual maturity, egg weight and mature body weight. It appears from this trait that

Table 3: *Coefficients of correlation and regression between bodyweights, body length, heart girth and height at the withers of backcross progenies at weaning age*

	Physical measurements	1	2	3	4
1	Body weight		0.86**	0.45*	0.92**
2	Body length	0.858**		0.47*	0.83**
3	Heart girth	0.446*	0.946**		0.49*
4	Height at withers	0.477*	0.827**		0.494*

Ns = No. significance indicated.

* = $P < 0.05$

** = $P < 0.01$

* All data above the diagonal refer to regression coefficients, while those below the line are correlation coefficients.

mature body weight. It appears from this trait that the combining ability of the reciprocal cross breed backcrossed to their inferior parents was better than that of the main crossbred backcrossed to their inferior parents. This is a welcome development in situations where heterosis may fail, then reciprocal crossings can be exploited.

Adebambo (1994) had observed maternal effect of growth performance traits which waned as soon as the animals were weaned. This sort of effect is important for traits which appear early in life like growth traits. Though maternal influences is strictly environmental, these effects can have both environmental and genotypic components with respect of the dam. This is why CTA, (1992) stated that the maternal influences can be important for the offspring at the time of birth and perhaps up to the time of weaning. They also noted that, the importance of the maternal effects usually becomes less after that, but sometimes never disappears completely.

Correlation between body measurements

The positive correlation between body weight and body length ($r = 0.858$) bodyweight and heart girth ($r = 0.446$) and bodyweight and height at

the withers ($r = 0.946$) as indicated in table 3 suggest that, there are direct and significant relationship between bodyweight and these parameters. This is in agreement with the findings of Johnson, (1981) that bodyweight is highly correlated with body measurements especially bodyweight and body length and height at the withers that recorded highly significant relationship.

This implies that, piglets increase in weight was a reflection of accretional increase in the sizes of the corresponding organs and different parts of the body. It indicates that bodyweight is the totality of aggregate organs and different parts that make up the body. If the organ and parts increase in size and weight, the total body size and weight also show positive increase. The body length was also correlated positively with heart girth ($r = 0.477$) and height at the withers ($r = 0.827$). Also, heart girth was also positively correlated with the height at the withers ($r = 0.494$). This agrees with the works of Ikeobi (1998) in which positive correlation was obtained between these parameters. In line with the correlation coefficients these parameters have linear and positive relationship with each other.

Regression between body measurements

The analysis of linear regression of bodyweight and other parameters on each other showed that the regression co-efficient for bodyweight on body length is positive (0.86) as well as the co-efficient for bodyweight on heart girth (0.45) and height at the withers (0.92). This shows that these other parameters are directly influenced by changes in bodyweight. That is to say that, any increase in bodyweight is as a result of an increase in the other parameters, namely: body length, heart girth and height at the withers. This is in line with the works of Johnson (1981). This researcher indicated that bodyweight is highly regressed by body measurements especially body length and height at the withers.

The regression co-efficient for body length on heart girth (0.47) and height at the withers (0.83) were also positive. Also, regression of heart girth on height at the withers (0.49) was positive. This showed that there was a direct relationship between heart girth and height at withers. Since positive regressions were obtained between the growth parameters, it might be concluded that these measurements have linear and positive relationship with each other.

The findings in the experiment showed that backcross progenies of F₁ crossbred dams crossed with their native parent had appreciable growth rate from birth to weaning. This had been reported in earlier works of Nwakpu and Omeje, (2002). It points to the genetic usefulness of our native boar used in the experiments. It was observed that piglets followed the same trend in growth and body size developments irrespective of the genotype of the crossbred dams indicating that they are progenies of their native parents.

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